4 What are the New Pollutants Regulated by the Rule?

In the April 15, 1998 rule, EPA established ELG&S for toxic and nonconventional pollutants that are characteristic of Subpart B and E mills that bleach pulp with chlorine-containing compounds. Table 4-1 shows which pollutants are regulated for mills with operations in Subpart B and E. Each of these pollutants is discussed below.

Table 4-1: Pollutants Regulated Under 40 CFR 430

Pollutants	Subpart B	Subpart E		
		NH_4-Based Segment	Na-,Ca-, Mg-Based Segment	Specialty-Grade Segment
Chloroform (a)	✓	Reserved	No requirement	Reserved
2,3,7,8-TCDF	✓	✓	No requirement	✓
2,3,7,8-TCDD	✓	✓	No requirement	✓
12 Chlorinated Phenolic Compounds	✓	✓	No requirement	✓
AOX (a)	✓	Reserved	✓	Reserved
COD	Reserved	Reserved	Reserved	Reserved

Chloroform. Chloroform is an extremely volatile compound that is generated during the bleaching of pulp with hypochlorite, chlorine, or chlorine dioxide. Hypochlorite bleaching results in the greatest amount of chloroform generation while chlorine dioxide bleaching results in the least amount of chloroform generation. As chloroform is generated, it partitions to air and to bleach plant effluent (though, some of the chloroform remains with the pulp). Any chloroform found in bleach plant effluent that is not emitted to the air prior to reaching the wastewater treatment plant is volatilized and degraded during secondary treatment.

2,3,7,8-TCDD (Dioxin) and 2,3,7,8-TCDF (Furan). The dioxin congener consists of two benzene rings connected by two oxygen bridges. There are eight positions where substitution of hydrogen atoms by other atoms or by organic or inorganic radicals can occur. 2,3,7,8-TCDD is one of 75 dioxin congeners and is the most toxic. The chlorinated dibenzofurans have similar structure, but have only one oxygen bridge rather than two. 2,3,7,8-TCDF is the most toxic of 135 chlorinated dibenzofurans.

During the late 1980s, bleaching with chlorine and hypochlorite were discovered to be sources of dioxin and furan. Although use of chlorine dioxide (ClO_2) bleaching minimizes the formation of chlorinated pollutants, measurable quantities of 2,3,7,8-TCDF and possibly 2,3,7,8-TCDD may still be formed. Dioxin and furan are not effectively degraded during wastewater treatment; they partition either to sludge or pass into receiving waters untreated.

Chlorinated Phenolic Compounds. Chlorinated phenolic compounds include phenols, guaiacols, catechols, and vanillins substituted with from one to five chlorine atoms per molecule. Typically, bleaching processes that result in the formation of 2,3,7,8-TCDD and 2,3,7,8-TCDF also generate the higher substituted tri-, tetra-, and penta-chlorinated compounds. EPA established effluent limitations guidelines and pretreatment standards for the following 12 chlorinated phenolic compounds:

- 4-Trichlrosyringol
- 3,4,5-Trichlorocatechol
- 3,4,6-Trichlorocatechol
- 3,4,5-Trichloroguaiacol
- 3,4,6-Trichloroguaiacol
- 4,5,6-Trichloroguaiacol
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol
- Tetrachlorocatechol
- Tetrachloroguaiacol
- 2,3,4,6-Tetrachlorophenol
- Pentachlorophenol

Secondary treatment can generally achieve about 50% removal of these compounds.

Adsorbable Organic Halides (AOX). AOX is a measure of the total amount of halogens (chlorine, bromine, and iodine) bound to dissolved or suspended organic matter in a wastewater sample. In the effluent of Subpart B and E mills, essentially all of the AOX is chlorinated compounds formed during bleaching with chlorine and other chlorinated bleaching agents. Inefficient application of chlorine-containing bleaching chemicals can generate increased levels of AOX. Minimizing AOX will usually have the effect of reducing the generation of chloroform, 2,3,7,8-TCDD, 2,3,7,8-TCDF, and chlorinated phenolic compounds. Some AOX is biodegraded during secondary treatment.

Chemical Oxygen Demand (COD). COD is a measure of the quantity of chemically oxidizable material present in wastewater. Sources of COD include the pulping area, recovery area, bleaching area, and papermaking area. A portion of COD is readily biodegradable while the rest is resistant to biodegradation (i.e., “refractory”). The refractory portion is derived from spent pulping liquor (i.e., kraft mill “black liquor” or sulfite mill “red liquor”), thus, COD biodegradability indicates the degree to which spent pulping liquor is recovered from brown stock pulp. Wastewater COD loads also correlate with discharges of toxic organic pollutants that are not readily biodegraded. (Note: EPA has not established COD ELG&S; however, EPA plans to do so in a future rulemaking.).